THE PROCEEDINGS OF THE PHYSICAL SOCIETY

FROM JANUARY 1942 TO NOVEMBER 1942

VOLUME 54

Published by
THE PHYSICAL SOCIETY
1 Lowther Gardens, Exhibition Road,
London, S.W.7

Printed by
TAYLOR AND FRANCIS, LTD.,
Red Lion Court, Fleet Street, London, E.C.4

OFFICERS AND COUNCIL, 1942–43

12310

President:

SIR CHARLES G. DARWIN, K.B.E., M.C., M.A., Sc.D., F.R.S.

Vice-Presidents who have filled the Office of President:

SIR CHARLES VERNON BOYS, LL.D., F.R.S.
C. H. LEES, D.Sc., F.R.S.
ALEXANDER RUSSELL, M.A., D.Sc., F.R.S.
SIR FRANK E. SMITH, K.C.B., G.B.E., D.Sc., F.R.S.
SIR OWEN W. RICHARDSON, M.A., D.Sc., F.R.S.
W. H. ECCLES, D.Sc., M.I.E.E., F.R.S.
SIR ARTHUR S. EDDINGTON, O.M., M.A., D.Sc., F.R.S.
A. O. RANKINE, O.B.E., D.Sc., F.R.S.
THE RIGHT HON. LORD RAYLEIGH, M.A., Sc.D., LL.D., F.R.S.
T. SMITH, M.A., F.R.S.
ALLAN FERGUSON, M.A., D.Sc.

Vice-Presidents:

G. I. FINCH, M.B.E., D.Sc., F.R.S.
J. H. BRINKWORTH, D.Sc.
C. D. ELLIS, B.A., PH.D., F.R.S.
H. T. FLINT, D.Sc., PH.D.

Hon. Secretaries:

W. JEVONS, D.Sc., PH.D. (*Business*)
J. H. AWBERY, B.A., B.Sc. (*Papers*)

Hon. Foreign Secretary:

SIR OWEN W. RICHARDSON, M.A., D.Sc., F.R.S.

Hon. Treasurer:

C. C. PATERSON, O.B.E., D.Sc., M.I.E.E., F.R.S.

Hon. Librarian:

L. C. MARTIN, D.Sc.

Ordinary Members of Council:

N. F. MOTT, M.A., F.R.S.
J. NICOL, B.A., B.Sc.
D. OWEN, B.A., D.Sc.
SIR EDWARD V. APPLETON K.C.B., M.A., D.Sc., LL.D., F.R.S.
MISS M. D. WALLER, PH.D.
E. N. DA C. ANDRADE, D.Sc., PH.D., F.R.S.
H. SHAW, D.Sc.
E. R. DAVIES, B.Sc.
W. B. MANN, PH.D.
A. J. PHILPOT, O.B.E., M.A., B.Sc.
H. C. WEBSTER, M.Sc., PH.D.
W. D. WRIGHT, D.Sc.

Editors:

Proceedings:
J. H. AWBERY, B.A., B.Sc.

Reports on Progress in Physics:
W. B. MANN, PH.D.

COLOUR GROUP

Chairman:
W. D. WRIGHT, D.Sc.

Hon. Secretary:
H. D. MURRAY, M.A., F.I.C.

OPTICAL GROUP

Chairman:
A. O. RANKINE, O.B.E., D.Sc., F.R.S.

Hon. Secretary:
L. C. MARTIN, D.Sc.

CONTENTS

Part 1. 1 *January* 1942

PAGE

J. G. GRUNDY. Problems of colour mixing in the dyeing industry 1

ROBERT SCHNURMANN and ERIC WARLOW-DAVIES. The electrostatic components of the force of sliding friction 14

H. R. NETTLETON and E. G. BALLS. The absolute measurement of electrical resistance by a method using the average electromotive force of a commutating generator 27

G. D. YARNOLD. Note on electric and magnetic dimensions 46

C. A. COULSON. Diamagnetic susceptibility of methane 51

V. D. HOPPER. Thermostats employing external surface control 55

S. WHITEHEAD. An approximate solution for the distribution of temperature or potential with cylindrical isothermal or equipotential surfaces 63

J. T. MACGREGOR-MORRIS and A. G. STAINSBY. A rotating differential photo-electric photometer for precision work. (Discussion.) 66

Reviews of books 70

Recent reports and catalogues 80

Part 2. 1 *March* 1942

J. G. HOLMES. The nature and measurement of whiteness 81

V. G. W. HARRISON. The measurement of near-whites in the paper industry . 86

C. G. HEYS HALLETT. The whiteness of cinema screens 98

D. E. M. GARFITT. The measurement of impulse voltages by means of small sphere gaps 109

W. E. BENHAM. The nature of temperature 121

H. H. MACEY. A problem in two-dimensional flow 128

W. H. J. FUCHS and R. KOMPFNER. On space-charge effects in velocity-modulated electron beams 135

C. W. HANSEL. Fundamental laws and definitions in physics : I—Ohm's law . 151

C. W. HANSEL. Fundamental laws and definitions in physics : II—Specific heat and Newton's law of cooling 159

C. W. HANSEL. Fundamental laws and definitions in physics : III—Mass . . 164

Reviews of books 205

Part 3. 1 *May* 1942

William David Coolidge : Eighteenth Duddell Medallist 209

DAVIS S. EVANS and K. MENDELSSOHN. The physics of blood-pressure measurement 211

F. H. G. PITT. Colour blindness and its importance in relation to industry . . 219

J. D. CRAGGS. Canal-ray positive-ion sources 245

R. E. SIDAY. The determination of the optical properties of thick magnetic lenses, and the application of these lenses to beta-ray spectrometry 266

G. F. C. SEARLE. The determination, by smoke manometer, of the ratio of density of town gas to that of air at the same temperature and pressure 278

B. K. JOHNSON. Demonstration. Photomicrographs illustrating the paper " An 'achromatic reflection microscope for use with visible or ultra-violet light " . 288

Discussion on papers by W. E. BENHAM and G. D. YARNOLD entitled " On the nature of temperature " and " Notes on electric and magnetic dimensions ", respectively 289

Obituary notices : PAGE

JULIUS RHEINBERG 297
MARK BENJAMIN 297
TOM HARRIS 298
Reviews of books 300
Recent reports and catalogues 302

Part 4. 1 *July* 1942

W. D. WRIGHT. Research on colour physics at South Kensington, 1877–1942 . 303
KATHLEEN LONSDALE. X-ray study of crystal dynamics : An historical and critical survey of experiment and theory 314
(The late) Sir WILLIAM BRAGG. The secondary X-ray spectrum of sylvine : Theory and experiment 354
MAX BORN. Lattice dynamics and X-ray scattering 362
M. BLACKMAN. Note on Raman's theory of the specific heat of solids . . . 377
A. CHARLESBY. Note on the comparison of the subsidiary maxima in electron diffraction and X-ray diffraction patterns from single crystals 379
Recent reports and catalogues 387
Reviews of books 388

Part 5. 1 *September* 1942

W. M. HAMPTON. Some problems relating to optical glass 391
W. V. MAYNEORD. The measurement of radiation for medical purposes . . 405
H. FRÖHLICH. Dielectric loss in paraffin-wax solutions 422
E. W. H. SELWYN. The dimensions of physical quantities 428
F. T. FARMER. An electrometer for measurement of voltage on small ionization chambers 435
J. D. CRAGGS. A high-voltage apparatus for atomic disintegration experiments . 439
R. C. EVANS and H. S. PEISER. A machine for the computation of structure factors 457
Reviews of books 463

Part 6. 1 *November* 1942

A. CHARLESBY. Influence of barrier dimensions on the vibrational spectrum of ethane 471
A. J. C. WILSON. The thermal expansion of aluminium : Further experiments . 487
Sir ARTHUR EDDINGTON. The theoretical values of the physical constants . . 491
W. E. DUNCANSON. Note on some recent papers on physical quantities and their dimensions 504
Discussion on papers by C. W. HANSEL entitled " Fundamental laws and definitions in physics " 509
Presentation of Duddell Medal 527
Obituary notices :
Sir WILLIAM BRAGG 531
WILLIAM ALFRED BENTON 535
FRANCIS JAMES SELBY 536
BERNARD MYNOTT NEVILLE 537
Reviews of books 538
Recent reports and catalogues 541
Index to volume 54 542
Index to reviews of books, volume 54 546

PROCEEDINGS AT THE MEETINGS OF THE PHYSICAL SOCIETY

SESSION 1941–42

24 *September* 1941

The fourth meeting of THE COLOUR GROUP. At the Imperial College, London, S.W. 7, Dr. W. D. Wright being in the Chair.

The following three papers on Whiteness were read and were followed by an informal discussion :

(i) " The nature and measurement of whiteness ", by J. G. Holmes, B.Sc.

(ii) " The measurement of near-whites in the paper industry ", by V. G. W. Harrison, Ph.D.

(iii) " The apparent whiteness of cinema screens ", by C. G. Heys Hallett, M.A.

---

10 *October* 1941

At the Imperial College, London, S.W. 7, the Acting President, Professor Allan Ferguson, being in the Chair.

The following were elected to Fellowship, the first five being transferred from Student Membership : Percy George Forsyth, Paul Howard-Flanders, Dennis Albert Nicholls, Lawrence William Walker, John Bernard Warren, Albert Edward Bishop, Patrick Moran, Stanley Austen Stigant, Hardwicke Slingsby Tasker, Walter Harold Ward, George Stuart James White.

It was announced that Council had elected the following to Student Membership : Margaret Elisabeth Jane Carr, Alan Stephen Edmondson, Joseph William Fox, George Francis Hodsman and Denys Haigh Wilkinson.

A lecture on " Recent work on the use of photo-electric rectifier-type cells in photometry " was delivered by Professor J. T. MacGregor-Morris, D.Sc., M.I.E.E., and was followed by an informal discussion.

---

10 *December* 1941

The fifth meeting of THE COLOUR GROUP. At the Lighting Service Bureau of the Electric Lamp Manufacturers' Association, London, W.C. 2, Dr. W. D. Wright being in the Chair.

A lecture on " Colour blindness and its importance in relation to industry " was delivered by F. G. H. Pitt, Ph.D., and was followed by an informal discussion.

The meeting was preceded by an Extraordinary General Meeting of the Group for the consideration and adoption of an amendment of a clause in the Constitution enlarging the Committee of the Group.

---

16 *January* 1942

At the Imperial College, London, S.W. 7, Sir William Bragg, Past President, being in the Chair.

The following were elected to Fellowship : George Keith Thurburn Conn, Stanley Walter Cousins (transferred from Student Membership), Cornelius Frank Dietrich, Trevor Anthony Eames, Eric Leopold Irwin Heinzelmann, R. G. Horner, Ronald Huby, Alan Orville Hunter, Basil Jacob, Sybil Mathews, Oliver Moriogh Moriarty, Robert Kenworthy Schofield, Paul Vigoureux, Felix Bernard White.

It was announced that Council had elected the following to Student Membership: Harold Raynor Allan, Edward Raymond Andrew, Kenneth Robert Atkins, Stanley Reginald Badcoe, Norman Rushton Bailey, John Robert Barker, Roderick K. Barnes, Clifford Henry James Beaven, Arthur Reginald Bevan, Margaret Joy Boyes-Watson, Roy Drakeley Brace, F. J. Bradshaw, A. P. Brain, David Brechner, R. I. B. Cooper, D. W. Davies, David John Day, Philip W. Day, Jack Dunkley, Frederick Henry East, David William Elson, Reginald Francis Farr, Geoffrey Charles Frederick Fisher, S. G. F. Frank, Anthony Philip French, R. M. Goody, J. Hawkins, Reginald Dennis Hayward, R. Heastie, Kenneth William Hillier, Francis Raymond Holt, Denys Stanley Hopper, Howard Arthur Hughes, Robert W. G. Hunt, William Alan Jennings, Ronald Frederick Johnston, Robert Henry Kay, John Edward Anthony Keen, Derek LaWindell Watts King, Peter Reginald Layton, George Matthew Leak, Ian Alexander Darroch Lewis, Keith B. Logie, Samuel Thomas Lunt, George Albert Mann, Wilfred John Mellors, James Woodham Menter, Robert Henry Merson, Thomas Alan Minns, Eric Norbury Mutch, Audrey Mary Brasnett Parker, John Robert Pollard, Ernest Henry Putley, Alan Purcell Roberts, Henry Sheppard, Norman Peter Staines, James Richard Stansfield, Kenneth H. Stewart, Alan Stott, Bernard Sugarman, Charles Alfred Taylor, David West, Douglas Francis White, Rudolf Arnold Wiersma, John Charles Willmott, Laurence William Stevens Wilson, Robert Lewis Woolley, Anthony Frank Woolner.

"A lecture on "X-ray study of crystal dynamics" was given by Mrs. Kathleen Lonsdale, D.Sc., and was followed by an informal discussion.

---

21 *January* 1942

A joint meeting with the Cambridge Philosophical Society at the Cavendish Laboratory, Cambridge, the Acting President, Professor Allan Ferguson, being in the Chair.

Dr. Kathleen Lonsdale repeated the lecture on "X-ray study of crystal dynamics" (in a modified form). The lecture was followed by an informal discussion.

---

6 *February* 1942

At the Imperial College, London, S.W. 7, the Acting President, Professor Allan Ferguson, being in the Chair.

The following were elected to Fellowship, the first seventeen being transferred from Student Membership: Maurice Darley Armitage, E. G. S. Blower, Philip Charles Bowes, Helen Sarah Griffin, Philip Halliday, A. Hammond, Robert James Hercock, Arthur Cambridge Merrington, David Colver Nutting, William Thomas Shipston Pearson, Willaim Roy Piggott, James Reekie, Raymond Frederick Saxe, Anthony Charles Shearman, Andrew Stratton, John Carruthers Weston, K. B. S. Willder, Henry Shull Arms, Robert Sidney Blackledge, Charles Edward Rhodes Bruce, Edwin Oswald Cook, Cyril Bertie Daish, Lionel James Davies, Arthur E. Evans, O. R. Frisch, William Reginald Stephen Garton, Kurt Martin Guggenheimer, Henry George William Harding, Vernon George Wentworth Harrison, Nicholas Kurti, John Mark Anthony Lenihan, Robert Schnurmann, Poul Arne Scott-Iversen, Alfred Morris Thomas, G. A. Veszi, William Henry Walton, William Harford Willott, Arthur James Cochran Wilson, W. Rees Wright.

The following papers were read and discussed:

"Electrical and magnetic dimensions", by G. D. Yarnold, M.A., D.Phil.

"The nature of temperature", by W. E. Benham, B.Sc.

---

11 *February* 1942

The sixth meeting of THE COLOUR GROUP. At the Imperial College, London, S.W. 7, Dr. W. D. Wright being in the Chair.

Dr. W. D. Wright, as Chairman of the Colour Group, delivered his address entitled "Research on Colour Physics at South Kensington, 1877–1942".

---

27 *February* 1942

At the Imperial College, London, S.W. 7, the President, Dr. C. G. Darwin, being in the Chair.

The following were elected to Fellowship, the last-named being transferred from Student Membership: Samuel John Martin, Edward Frank Michaelson and Ronald Charles Pankhurst.

A lecture on "Measurement of radiation for medical purposes" was delivered by Professor W. V. Mayneord, D.Sc., and was followed by an informal discussion.

---

6 *March* 1942

The first meeting of THE OPTICAL GROUP. At the Science Museum and the Imperial College, London, S.W. 7, Dr. A. O. Rankine being in the Chair.

A Draft Constitution of the Optical Group as drawn up by the Committee of the Group was discussed and adopted. The Chairman, Honorary Secretary, and Committee of the Group for 1942–43 were elected.

A lecture on "Problems relating to optical glass" was delivered by W. M. Hampton, Ph.D., and was followed by an informal discussion.

The following papers were read and discussed:

"A multi-purpose collimator", by R. J. Bracey, and

"Thermal effects on the performance of lens systems", by J. W. Perry.

---

20 *March* 1942

At the Science Museum, London, S.W. 7, the President, Dr. C. G. Darwin, being in the Chair.

The following were elected to Fellowship: Fred Bovey, John Crank, Bertram John Frederick Dorrington, Walter Stevenson Joyce, John Smith Macpherson, Alex Renfrew Miller (transferred from Student Membership), George Mole, Dorothy L. Tilleard.

It was announced that Council had elected the following to Student Membership: Herbert Cairns Bolton, Kenneth John Carpenter, Norman Cusack, Grahame John Dickins, Gareth Wyn Evans, Douglas Hugh Everett, John Gadsby, Geoffrey Blakeley Greenough, M. H. James Hawkins, Frederick G. Hellyer, James Morden Hough, Fathi As'ad Qaddura, Alan Gerald Senior, J. R. Ennis Smith, Alexander R. Stokes, Ronald Walter Tiffen, Nigel Graham Trott, Theodore James Tulley, Anthony H. Willbourn, Donald Williams.

The twenty-sixth Guthrie Lecture was delivered by Sir Edward Appleton, K.C.B., M.A., D.Sc., LL.D., F.R.S., who took as his subject "Ionospheric influences on geomagnetism".

---

27 *March* 1942

The seventh meeting of THE COLOUR GROUP. At the Midland Hotel, Manchester, Professor Allan Ferguson, Past President, being in the Chair.

A paper on "The physical significance of the dyers' system of colour matching", by G. S. J. White, B.A., T. Vickerstaff, Ph.D., and E. Waters, B.Sc., was read and discussed.

---

9 *April* 1942

A joint meeting with the Science Masters' Association at Rugby School, Professor Allan Ferguson, Past President, being in the Chair.

A discussion was held on certain aspects of the teaching of Physics in schools, the opening papers being:

"Fundamental laws and definitions in physics: I—Ohm's law; II—Specific heat and Newton's law of cooling; III—Mass", by C. W. Hansel, B.Sc.

"The need for a permanent standardization and guidance committee for elementary physics", by P. Woodland, M.A.

---

15 *May* 1942

The second meeting of THE OPTICAL GROUP. At the Imperial College, London, S.W. 7, Dr. A. O. Rankine being in the Chair.

A demonstration of apparatus for micro-film processes was given by B. K. Johnson.

The following papers were read and discussed:

"A method of focusing photographic lenses", by E. W. H. Selwyn, B.Sc.

"A spectrohelioscope", by the Rev. W. Rees Wright, M.Sc., F.R.A.S.

A lecture on "The principles of the use of non-reflecting films in optical instruments" was delivered by K. M. Greenland, Ph.D.

---

20 *May* 1942

A joint meeting with the Royal Meteorological Society at the Imperial College, London, S.W. 7, the Chair being taken first by Professor G. I. Finch, Vice-President, and afterwards by Professor D. Brunt, President of the Royal Meteorological Society.

The following were elected to Fellowship: Dorothy Alice Baker, George Henry Giles, James Arthur Gordon, Cyril Harold Marsh, George Robert Noakes, Leonard Rotherham.

It was announced that the Council had elected the following to Student Membership: Harry E. Airey, John Geoffrey Dawes, Arthur Dennis Kent, Alan Denis McQuillan, Arthur James Shiell, Harry Shorland.

A discussion was held on "Emission and absorption of radiation in the atmosphere", the opening paper being by Dr. T. G. Cowling and further contributions by Dr. G. M. B. Dobson, Professor H. Dingle, Dr. R. W. B. Pearse, Dr. A. G. Gaydon, Dr. L. Kellner, Dr. G. B. B. M. Sutherland, Professor F. A. Paneth, Professor P. A. Sheppard, Mr. E. Gold and Professor D. Brunt.

---

27 *May* 1942

The eighth meeting of THE COLOUR GROUP. At the Royal Photographic Society, London, S.W. 7, Dr. W. D. Wright being in the Chair.

Dr. R. A. Houstoun's colour-vision apparatus was demonstrated by J. W. Perry.

A paper on the "Relative merits of spectrophotometry and colorimetry" was read by Miss Dorothy L. Tilleard, B.Sc., and was followed by an informal discussion.

---

5 *June* 1942

At the Lighting Service Bureau of the Electric Lamp Manufacturers' Association, London, W.C. 2, Dr. A. O. Rankine, Chairman of the Optical Group and Past President of the Society, being in the Chair.

The following were elected to Fellowship: John Frederick William Bell, Edmund John Bowen, Hugh Mills Bunbury, Donald Anderson Crooks, George Henry Morris Farley, Kenneth Joseph Habell, William Francis Holford, Stewart Paterson (transferred from Student Membership), H. M. Powell, Edwin Garnet Stanford, Alice Christine Stickland, Percy Woodland.

A lecture on "Electric discharge lamps" (with demonstration) was given by Mr. E. B. Sawyer.

---

17 *July* 1942

The third meeting of THE OPTICAL GROUP. At the Imperial College, London, S.W. 7, Dr. A. O. Rankine being in the Chair.

A demonstration entitled "A trial of the Gaviola test for astronomical mirrors" was given by T. J. Tulley, B.Sc.

A paper on "The uses of optical instruments in the Army, and their influence on the test methods and limits", by Major E. Golding, R.A., was read and discussed.

A lecture, with experimental demonstrations, on "The interferometer in lens and prism manufacture" was given by F. Twyman, F.R.S.

REPORT OF COUNCIL FOR THE TEN MONTHS ENDED 31 DECEMBER 1941

INTRODUCTORY AND GENERAL

THE Council has recently decided that the year covered by its annual report shall end on the same date as that covered by the Honorary Treasurer's Report and the Annual Accounts and Balance Sheet. The present report, therefore, covers the ten months ended 31 December 1941, instead of the year ended 28 February 1942.

The period under review is to be regarded as one of continued progress and success, evidence of which is to be seen in the growing roll of membership, the satisfactory attendances at most of the science meetings, the cordial approval and support given to the Colour Group and the more recently formed Optical Group, the outside sales of the *Proceedings*, *Reports* and other publications, and the encouraging financial position of the Society. To bring about this result in the present unfavourable circumstances has demanded a strenuous and continuous effort on the part of everyone concerned, senior and junior alike. That progress is being made in several directions is largely due to the response of many of our members to the *Special Notice* which, as in the two previous years, was issued by the officers at the opening of the session in October. This notice emphasized the need for whole-hearted co-operation, particularly in bringing the advantages of membership to the notice of possible new Fellows and Student Members, and in bringing the *Proceedings* to the notice of possible new advertisers.

Since the end of September, 1941,* the Society has been the sole tenant of the upper part of 1 Lowther Gardens, Exhibition Road, London, S.W. 7. Extremely favourable terms of tenancy were offered by Dr. Evelyn Shaw on behalf of the Royal Commissioners for the Exhibition of 1851 and accepted by the Officers and Council on behalf of the Society; and the Society has far more adequate accommodation for its office, its library and its stock than it would be able otherwise to obtain for a comparable, or even much greater, financial outlay. We wish to place on record the cordial thanks of the Society to Dr. Shaw and the Royal Commissioners for their generosity. Advantage has been, and is still being, taken of the opportunity afforded by the change for a rearrangement of the offices and publications. Fire-guard duties have fallen very heavily on the small staff, especially since the only male junior clerk left in September, 1941. The major part has necessarily fallen to the Honorary Secretary for Business: to him, and also to Mrs. Jevons and Dr. and Mrs. R. W. B. Stephens, who have taken a share of these duties, the thanks of the Society are accorded.

The representatives of the Society on other Bodies are the same as those given in the Council's Reports for 1939–40 and 1940–41.

MEETINGS

An Annual General Meeting was held at the Science Museum on 25 July 1941 for the presentation and adoption of the Reports of the Council and the Honorary Treasurer and for the election of the Officers and Council for 1941–42. The new President, Dr. C. G. (now Sir Charles) Darwin, nominated his predecessor, Professor Allan Ferguson, as Acting President during his impending absence; Dr. Darwin returned from the United States of America a few weeks after the end of the period under review.

In regard to Science Meetings, as was mentioned in last year's report, there is a greater demand for the exposition and discussion of a single topic than for the reading of several disconnected papers at a single meeting. The series of "Lecture surveys" and informal discussions begun last year was continued at four meetings, all at the Imperial College, the subjects and lecturers being: *Gravity Meters* (Dr. J. McG. Bruckshaw), *The Magnetic Hysteresis Cycle and its Interpretation* (Professor L. F. Bates), *The Mechanical Strength of Glass* (Professor W. E. S. Turner), and *The Use of Photo-electric Rectifier-type Cells in Photometry* (Professor J. MacGregor-Morris). Most of these "lecture-surveys" were accompanied by demonstrations, and five of the series, including the two reported last year, have been so far published in the *Proceedings*. The average attendance at these meetings was 40.

The remaining three science meetings were devoted to the 25th Guthrie Lecture, the 12th Thomas Young Oration and the 1st Charles Chree Address.

* The Institute of Physics, whose office had been moved to the University of Reading on the outbreak of the war, continued to use 1 Lowther Gardens as its registered address until this date, when its tenancy of the rooms was terminated

GUTHRIE LECTURE

The twenty-fifth Guthrie Lecture was delivered by Professor E. N. da C. Andrade on 4 April 1941 at the Royal Institution, the subject of the lecture being " A Problem of Guthrie's Time, The Sensitive Flame " (*Proceedings*, **53**, 329, 1941).

THOMAS YOUNG ORATION

The twelfth Thomas Young Oration was delivered on 30 May 1940 at the Science Museum by the Astronomer Royal, Dr. H. Spencer Jones, who took as his subject " The 200-inch Telescope " (*Proceedings*, **53**, 497, 1941).

CHARLES CHREE MEDAL, PRIZE AND ADDRESS

The award of the first Charles Chree Medal and Prize to Professor Sydney Chapman was announced in last year's Report. The presentation was made at the Science Museum on 25 July 1941, when Professor Chapman delivered the first Charles Chree Address on " (i) Charles Chree and his Work on Geomagnetism, (ii) Geomagnetic Time Relationships, and (iii) The Future of World Magnetic Surveying " (*Proceedings*, **53**, 629, 1941).

A suitably inscribed bronze replica of the medal was subsequently presented to Miss Jessie S. Chree, who was unable to be present when the Address was delivered.

DUDDELL MEDAL

The Council awarded the eighteenth Duddell Medal to Dr. William David Coolidge, of the Research Laboratories of the General Electric Company of America, Schenectady, New York, in recognition of his work in the development of new instruments and appliances, and especially of the heated-cathode high-vacuum x-ray tube. Since the end of the period covered by this report the medal has been presented to Dr. Coolidge by Viscount Halifax, H.M. Ambassador at Washington, at a meeting of the American Physical Society at Baltimore on 1 May 1942 (*Proceedings*, **54**, 209 and 527, 1942).

PUBLICATIONS

The two-monthly parts of the *Proceedings* have been issued as early as possible after the usual dates of publication. As was to be expected, Volume 53 (1941) is considerably smaller than Volume 52, the sizes of these being about 72 and 82 per cent, respectively, of the average size of the two preceding volumes. A further diminution will be necessary in Volume 54 (1942), as the supply of paper for the Society's publications is now (since the middle of 1941) issued under licence by the Ministry of Supply Paper Control, and the utmost care has to be taken to enable the work of the Society to be continued with the much reduced quantities of paper allotted at present, and the still smaller quantities licensed for the near future. The September issue of the *Proceedings* was the first to be printed on the new paper, which, though inferior to our former stock (purchased in 1940), is still of good quality.

The space devoted to advertisements in the *Proceedings* has steadily increased, and has now almost reached the maximum annual total permitted by the Paper Control. Throughout 1941 space was again put at the disposal of the Red Cross and St. John War Organization and the National Savings Committee.

Volume 7 (1940) of the *Reports on Progress in Physics* was published in April 1941, and Volume 8 (1941), the preparation of which was begun early in the period under review, has now been published (April 1942). The sales of Volume 7 have been very satisfactory, and the demand for earlier volumes of the series has been well maintained. In order to meet this demand the Society still wishes to purchase copies of Volumes 1 (1934), 2 (1935), and 4 (1937).

During 1941, the Society, in common with all publishing bodies in this country, experienced increasing difficulties caused by the additions to the long list of countries to which scientific publications may not be exported. We are fortunate in having an increased number of subscribers to the *Proceedings* both in the U.S.A. and in the U.S.S.R.; but nearly all other overseas markets outside the British Empire are now closed to us. Losses of copies of our publications in ocean transit have, of course, been considerable at certain times. The Council again records its thanks to Miss Madeline M. Mitchell, Publications Manager of the American Institute of Physics, for her continued kindness in making the volumes of *Reports on Progress in Physics* available at the office of the Institute,

175 Fifth Avenue, New York, and in bringing the publications and membership of our Society to the notice of American physicists.

MEMBERSHIP

From the following table of membership figures at the end of 1941 it is gratifying to note (i) that the slight decrease in the total reported last year has been far more than made up; (ii) that each of the two classes of membership has increased; and (iii) that of those who had reached the end of their period of Student Membership more than two-thirds were transferred to Fellowship. It should be added that the December total of 1107, which was the highest in the history of the Society, has since been improved upon.

MEMBERSHIP ROLL ON 31 DECEMBER 1941

		Honorary Fellows	Honorary Fellows, Optical Society	Ex-officio Fellows	Fellows	Student Members	Total
31 Dec. 1940, Total		11	3	4	935	117	1070
Changes during 1941	Elected				28	51	
	Transferred				13 (+41)	13	
	Deceased				9	2	
	Resigned or lapsed				20 (−35)	3 (−20)	
	Suspended				6	2	
	Net increase				+6	+31	+37
31 Dec. 1941, Total		11	3	4	941	148	1107

OBITUARY

The Council records with regret the deaths of the following Fellows :—Dr. R. T. Beatty, Dr. M. Benjamin, Mr. I. O. Griffith, Mr. W. H. Heaton, Dr. G. W. C. Kaye, Dr. C. G. Schoneboom, Mr. J. J. Stewart, Mr. R. J. Trump, and also the deaths of Mr. R. A. Day and Mr. J. Hutchinson, Student Members of the Society.

COLOUR GROUP

Five scientific meetings of the Colour Group were held in 1941, four in London and one in Bradford, the average attendance being about 50. The subjects discussed and other particulars are as follows :—

(i) *Colour Tolerance* ; at the Polytechnic, Regent Street, on 12 February ; an introductory paper by Dr. W. D. Wright and a group of three papers, two of which, by Mr. J. W. Perry and Mr. H. W. Ellis, on the physical and technical aspects, respectively, have been published in the *Proceedings*, **53**, 273 and 288 (1941). A short account of this inaugural meeting, prepared by Dr. Wright, was published in *Nature*, **147**, 303 (8 March 1941).

(ii) *Colour Terminology* ; at the Royal Photographic Society, on 30 April ; a paper by Mr. H. D. Murray, published in the *Journal of the Oil and Colour Chemists' Association*, **25**, 205 (1941).

(iii) *Colour Mixture Problems in the Dyeing Industry* ; at Bradford, on 25 June ; a lecture by Mr. J. G. Grundy, published in the *Proceedings*, **54**, 1 (1942).

(iv) *Whiteness* ; at the Imperial College, on 24 September ; a group of three papers by Mr. J. G. Holmes, Dr. V. G. W. Harrison and Mr. C. G. Heys Hallett, respectively, published in the *Proceedings* **54**, 81, 86 and 98 (1942).

(v) *Colour Blindness and its Importance in Relation to Industry* ; at the Electric Lamp Manufacturers' Association Lighting Service Bureau, on 10 December ; paper by Dr. F. H. G. Pitt, published in the *Proceedings*, **54**, 219 (1942).

The supply of off-prints of the papers and discussions to members of the Group has been arranged for. Arrangements have also been made for the exchange of off-prints with the Inter-Society Colour Council in the U.S.A., with whom close contact has been maintained.

In accordance with the item of the constitution which provides for the participation of certain other Societies, Institutions and Associations in the organization and activities of the Group, the following are now enlisted as participating Bodies : British Kinematograph Society, Illuminating Engineering Society, Institute of Physics, Royal Photographic Society, Society of Dyers and Colourists, Society of Glass Technology, Oil and Colour Chemists' Association, Physiological Society, and certain Committees of the British Standards Institution. It is evident from this list that the Group has already succeeded in bringing many colour interests together, a result of no small value to both science and industry.

Two sub-committees have been set up, to deal with Colour Terminology and with Colour Blindness in Industry, respectively.

The membership of the Group on 31 December 1941 was made up as follows :—

Members of the Physical Society	47
Members of other participating bodies	63
Members of six firms subscribing for sustaining membership ..	17
Other individual members	5
Total ..	132

OPTICAL GROUP

For some time past the officers of the Society have received many suggestions that a Group should be formed under the auspices of the Society, on lines similar to those of the Colour Group, for the consideration of scientific and technical problems in Optics. It was felt that, by holding meetings for the discussion of matters of current interest, the proposed Group could perform an important and valuable service in the present emergency, in which so many of those engaged on optical work are experiencing unexpected difficulties in the solution of their new problems.

The proposed Group should have the much desired effect of bringing together again many who have felt that their particular needs have not been met adequately since the merging of the Optical Society and the Physical Society of London. Indeed, it would appear that such a Group is the best, or even the only, means whereby the enlarged Physical Society can meet those needs.

The formation of the Optical Group was recommended at a well-attended preliminary meeting of those interested on 17 December 1941, and approved by the Council on 23 December, and the following were nominated as its first officers and committee :

Chairman : Dr. A. O. Rankine.

Honorary Secretary : Professor L. C. Martin.

Committee : Instr.-Capt. T. Y. Baker, Mr. R. J. Bracey, Mr. W. H. A. Fincham, Dr. V. G. W. Harrison, Mr. W. C. Hynd, Dr. H. Lowery, Capt. T. Martin, Mr. J. Perry, Mr. E. W. H. Selwyn.

Fellows and Student Members of the Society are eligible for membership of the Optical Group without additional annual subscription ; members of several other Societies, Institutions and Associations are eligible upon payment of an annual subscription of 5*s.* ; and other persons are eligible upon introduction by a member of the Physical Society or of one of these participating bodies and payment of an annual subscription of 10*s.* 6*d.*

It is proposed that about six meetings of the Group shall be held in each year. Papers read and discussed at these meetings may be communicated for publication in the *Proceedings* or in any other appropriate journal. A summary of the papers and a record of the activities of the Group will be prepared annually by the Chairman and published in the *Proceedings*.

REPORT OF THE HONORARY TREASURER FOR THE YEAR ENDED 31 DECEMBER 1941

The accounts show an excess of income over expenditure in 1941 of about £140. This result was achieved, however, only with the aid of a publications grant of £200 by the Royal Society from the Rockefeller Foundation Gift, which is gratefully acknowledged. The financial position at the end of the year was thus not quite so favourable as at the end of 1940, when the excess of income (apart from a very generous anonymous gift) was about £192. In the expenditure account every item but one shows a small increase: the increase in connection with the tenancy of 1 Lowther Gardens is accounted for partly by Air Raid Precautions and partly by the termination of the tenancy of the Institute of Physics at the end of the third quarter—the Physical Society now being responsible for the whole of this expense. In the income account it is satisfactory to note appreciable increases in the entrance fees, annual subscriptions, sales of publications, and advertisement revenue.

No change has been made in the Society's investments, the total value of which on 31 December 1941, as given in a statement by the Manager of the Charing Cross Branch of Westminster Bank, Ltd., was £620 higher than at the end of 1940. The stock of publications, which has not been re-valued, has changed but little in total amount during the year.

(Signed) C. C. PATERSON,
Honorary Treasurer.

18 *August* 1942.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 DECEMBER 1941

1940 £	EXPENDITURE	£ s. d.	£ s. d.
	To		
95	"Science Abstracts"		201 7 3
	Normal Publications:		
1492	"Proceedings"	1905 4 11	
52	Agenda papers and Notices	37 19 3	
674	"Reports on Progress in Physics"	693 0 0	
			2636 4 2
286	Postage on Normal Publications and General Correspondence		234 6 6
26	Expenses at Meetings		43 15 10
—	Honoraria to Special Lecturers		40 0 0
	Administration Expenses:		
754	Secretarial and Clerical Assistance and Office Expenses	760 7 5	
74	1 Lowther Gardens (including Air Raid Precautions)	95 6 0	
			855 13 5
892	*Balance, being excess of Income over Expenditure, carried forward to Accumulated Fund*		140 1 1
£4345			£4151 8 3

1940 £	INCOME	£ s. d.	£ s. d.
	By		
	Subscriptions:		
19	Entrance Fees	35 14 0	
1655	Fellows	1691 13 8	
58	Student Members	85 1 6	
—	Colour Group	23 8 6	
105	For "Science Abstracts" and Advance Proofs	111 19 4	
			1947 17 0
	Sales:		
649	"Proceedings"	797 7 8	
707	"Reports on Progress in Physics"	616 10 3	
4	Special Publications	47 16 9	
			1461 14 8
100	Advertisements in "Proceedings"		235 19 10
278	Dividends from Investments		285 16 9
70	Transfer from Life Composition Fund of amounts paid by Fellows now deceased		20 0 0
—	Publications Grant by the Royal Society from the Rockefeller Foundation Gift		200 0 0
700	Anonymous Donations		— — —
£4345			£4151 8 3

BALANCE SHEET AS ON 31 DECEMBER 1941

LIABILITIES	£ s. d.	£ s. d.
Sundry Creditors		120 3 9
Life Compositions:		
As on 31 December 1940	1501 0 0	
Less Transfer to Income and Expenditure Account	20 0 0	
		1481 0 0
Subscriptions received in advance:		
Members	43 19 2	
Publications	51 2 1	
		95 1 3
SPECIAL FUNDS:		
W. F. Stanley Trust Fund	259 0 0	
Duddell Memorial Trust Fund	379 4 9	
"Progress Reports" Reserve Account	83 1 0	
Herbert Spencer Legacy	239 7 6	
Charles Chree Medal and Prize Fund	1880 12 0	
		2841 5 3
GENERAL FUND:		
As on 31 December 1940	4206 18 9	
Add Balance of Income and Expenditure Account	140 1 1	
		4346 19 10
		£8884 10 1

ASSETS	£ s. d.	£ s. d.
Investments at Market Value on 31 December 1939:		
W. F. Stanley Trust Fund	259 0 0	
Duddell Memorial Fund	374 0 0	
Charles Chree Medal and Prize Fund	1866 10 0	
Physical Society	5917 10 0	
		8417 0 0
(Market Value on 31 December 1941: £9650.)		
Dividends due from Investments		54 12 1
Inland Revenue—Income Tax recoverable for 1941		55 10 10
Subscriptions due		75 15 10
Sundry Debtors		135 6 5
Stock of Paper and Binding Material		95 8 4
Cash at Bank	35 12 4	
,, *in Hand*	14 10 11	
,, *in Post Office Savings Bank Account*	13 4	
		50 16 7
		£8884 10 1

We have audited the above Balance Sheet and have obtained all the information and explanations we have required. We have verified the bank balances and the Investments. In our opinion such Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs according to the best of our information and the explanations given to us and as shown by the books of the Society.

SPENCER HOUSE, SOUTH PLACE, E.C. 2.
28*th August* 1942.

KNOX, CROPPER & Co.,
Chartered Accountants.

LIFE COMPOSITION FUND ON 31 DECEMBER 1941

	£	s.	d.
29 Fellows paid £10	290	0	0
1 Fellow paid £15	15	0	0
14 Fellows paid £21	294	0	0
28 Fellows paid £31 10s.	882	0	0
	£1481	0	0

SPECIAL FUNDS

W. F. STANLEY TRUST FUND

	£	s.	d.		£	s.
Carried to Balance Sheet	259	0	0	£300 Southern Railway Preferred Ordinary Stock	199	0
				£442 Southern Railway Deferred Ordinary Stock	60	0
	£259	0	0		£259	0

DUDDELL MEMORIAL TRUST FUND

Capital

	£	s.	d.		£	s.
Carried to Balance Sheet	374	0	0	£400 3½% War Loan Inscribed "B" Account	374	0

Revenue

	£	s.	d.		£	s.
Balance on 31 December 1940	8	15	3	Interest on War Loan	14	0
Balance carried to Balance Sheet	5	4	9			
	£14	0	0		£14	0

"PROGRESS REPORTS" RESERVE ACCOUNT

	£	s.	d.		£	s.
Balance carried to Balance Sheet	83	1	0	Balance on 31 December 1940	83	1

HERBERT SPENCER LEGACY

	£	s.	d.		£	s.
Balance carried to Balance Sheet	239	7	6	Balance on 31 December 1940	239	7

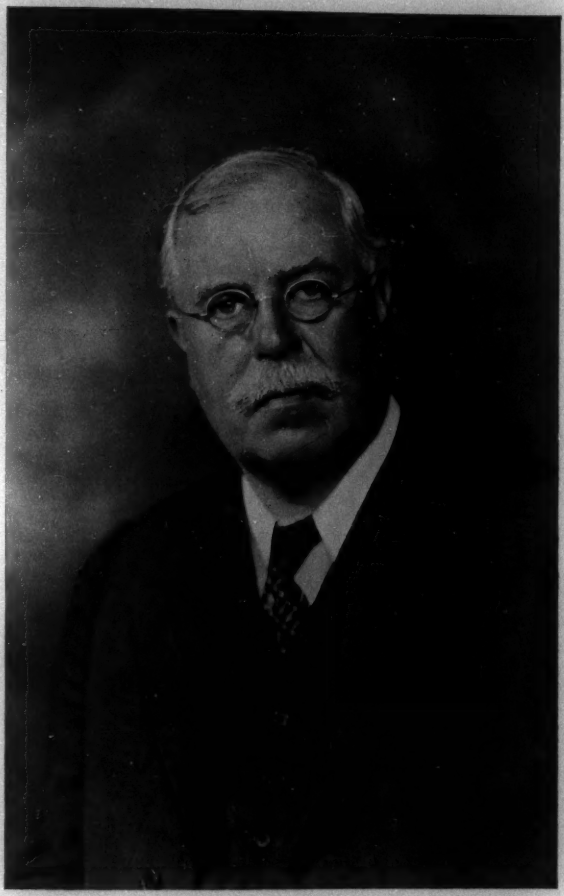
CHARLES CHREE MEDAL AND PRIZE FUND

Capital

	£	s.	d.		£	s.
Design of Medal and Preparation of Die	200	0	0	Balance on 31 December 1940	2065	16
Balance carried to Balance Sheet	1865	16	4			
	£2065	16	4		£2065	16

Revenue

	£	s.	d.		£	s.
Charles Chree Prize	136	10	0	Balance on 31 December 1940	106	9
,, ,, Medal	4	14	6	Interest on Investments	68	17
Printing Certificates	19	6	0			
Balance carried to Balance Sheet	14	15	8			
	£175	6	2		£175	6



[*Photo*: *Lafayette*

PROF. ALLAN FERGUSON,
President of the Physical Society, 1938–41.

[*Frontispiece*

[*Reproduced by permission from Quart. J. R. Met. Soc., Vol.* 60 (1934).

PROF. SYDNEY CHAPMAN, M.A., D.Sc., F.R.S.,
First (1941) Chree Medallist.